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AMENDMENTS TO THE CLAIMS:

1. (Original) A method of producing a semi-solid material without stirring, comprising:

heating a metal alloy to form a metallic melt;

regulating the transfer of an amount of the metallic melt into a temperature-controlled vessel; and

crystallizing the metallic melt in the vessel by cooling the metallic melt at a controlled rate less than 0.5 degrees Celsius per second without the use of a grain refiner and without mechanical agitation at any point during the crystallizing to form a semi-solid material having a microstructure comprising rounded solid particles dispersed in a liquid metal matrix and having an average diameter no greater than about 50 μm.

2.-4. (Cancelled)

5. (Original) The method of claim 1, wherein the regulating includes transferring the metallic melt into the vessel at a selected transfer temperature.

6. (Original) The method of claim 5, wherein the selected transfer temperature is between the coherency temperature of the metal alloy and about 25 degrees Celsius above the liquidus temperature of the metal alloy.

7. (Original) The method of claim 6, wherein the selected transfer temperature is between about 3 degrees Celsius above the liquidus temperature of the metal alloy and about 15 degrees Celsius above the liquidus temperature of the metal alloy.

8. (Original) The method of claim 1, wherein the regulating further includes preheating the vessel to a selected vessel temperature prior to transferring the metallic melt into the vessel.

9. (Original) The method of claim 8, wherein the selected vessel temperature is between about 606 degrees Celsius and about 610 degrees Celsius.

10. (Currently Amended) A method of producing a semi-solid material without stirring, comprising:

heating a metal alloy to form a metallic melt;

transferring a portion of the metallic melt into a temperature-controlled holding vessel;

controllably adjusting the temperature of the metallic melt in the temperature-controlled holding vessel to a selected transfer temperature;

regulating the transfer of an amount of the metallic melt from the temperature-controlled holding vessel into a temperature-controlled forming vessel; and

crystallizing the metallic melt in the forming vessel by cooling the metallic melt at a controlled rate to form a semi-solid material having a microstructure comprising rounded solid

particles dispersed in a liquid metal matrix.

11. (Original) The method of claim 1, wherein the regulating further includes transferring the metallic melt into the vessel at a selected rate of transfer.

12. (Original) The method of claim 11, wherein the selected rate of transfer is between about 0.01 pounds per second and about 1.0 pounds per second.

13. (Original) The method of claim 12, wherein the selected rate of transfer is about 0.50 pounds per second.

14. (Original) The method of claim 11, wherein the regulating further includes transferring a select amount of the metallic melt into the vessel.

15. (Original) The method of claim 14, wherein the select amount is between about 0.50 pounds and about 10 pounds.

16. (Original) The method of claim 1, wherein the regulating includes controlling a differential between the temperature of the metallic melt during the heating and the temperature of the metallic melt during the transferring.

17. (Original) The method of claim 16, wherein the regulating includes controlling a drop in temperature of the metallic melt during the transferring of the metallic melt into the vessel.

18. (Original) The method of claim 1, wherein the metal alloy is heated to a temperature no greater than 40 degrees Celsius above the liquidus temperature of the metal alloy to form the metallic melt.

19. (Original) The method of claim 1, wherein the rounded solid particles are partially dendritic.

20. (Original) The method of claim 1, wherein the rounded solid particles have a diameter in a range between about 40 μm and about 50 μm.

21.-23. (Cancelled)

24. (Original) The method of claim 1, wherein the temperature-controlled vessel is a shot sleeve of a semi-solid forming press.

25. (Original) The method of claim 24, further comprising:

injecting the semi-solid material from the shot sleeve directly into a die mold; and

forming the semi-solid material into a shaped part.

26. (Original) The method of claim 25, wherein the shot sleeve includes:

a passage for receiving the semi-solid material; and

a ram displaceable along the passage; and

wherein the method further comprises injecting the semi-solid material into the die mold at a controlled rate by regulating displacement of the ram along the passage.

27.-49. (Cancelled)

50. (Original) A method of semi-solid forming a shaped article, comprising:

providing a metal alloy, a temperature-controlled vessel and a mold;

heating the metal alloy to form a metallic melt;

regulating the transfer of an amount of the metallic melt into the temperature-controlled vessel; and

crystallizing the metallic melt in the vessel by cooling the metallic melt at a controlled rate less than 0.5 degrees Celsius per second to produce a semi-solid material having a microstructure comprising rounded solid particles dispersed in a liquid metal matrix;

feeding the semi-solid material from the temperature-controlled vessel directly into the mold without transferring the semi-solid material to an intermediate container; and

forming the semi-solid material into a shaped article.

51. (Original) The method of claim 50, wherein the vessel comprises:

a passage for receiving the metallic melt; and

a ram displaceable along the passage, the feeding comprising injecting the semi-solid material directly into the mold by displacing the ram along the passage.

52. (Original) The method of claim 51, further comprising controlling the rate of displacement of the ram to provide non-turbulent flow of the semi-solid material into the mold.

53. (Original) The method of claim 52, wherein the rate of displacement of the ram is between about 1 inch per second and about 50 inches per second.

54. (Original) The method of claim 53, wherein the rate of displacement of the ram is between about 1 inch per second and about 10 inches per second.

55. (Original) The method of claim 50, wherein performance of the transferring, nucleating, crystallizing and feeding occur within a total cycle time of less than 60 seconds.

56. (Original) The method of claim 50, wherein performance of the nucleating, crystallizing and feeding occurs within a total cycle time of less than 45 seconds.

57. (Original) The method of claim 50, wherein performance of the nucleating and crystallizing occurs within a total cycle time of less than 30 seconds.

58.-65. (Cancelled)

66. (Original) A method of producing a semi-solid material without stirring, comprising:

heating a metal alloy to form a metallic melt;

preheating a temperature-controlled vessel to a selected vessel temperature prior to transferring metallic melt therein;

regulating the transfer of a select amount of the metallic melt into the vessel, the regulating comprising:

transferring the metallic melt into the vessel at a selected transfer temperature and at a selected transfer rate; and

controlling a differential between the temperature of the metallic melt during the heating and the temperature of the metallic melt during the transferring; and

crystallizing the metallic melt in the vessel by cooling the metallic melt at a controlled rate without the use of a grain refiner and without mechanical agitation at any point during the crystallizing to form a semi-solid material having a microstructure comprising rounded solid particles dispersed in a liquid metal matrix.

67. (Original) The method of claim 66, wherein the select amount of the metallic melt transferred in the vessel is between about 0.50 pounds and about 10 pounds.

68. (Original) The method of claim 66, wherein the selected transfer temperature is between the coherency temperature of the metal alloy and about 25 degrees Celsius above the liquidus temperature of the metal alloy; and

wherein the selected transfer rate is between about 0.01 pounds per second and about 1.0 pounds per second.

69. (Original) The method of claim 66, wherein the regulating further comprises controlling a drop in temperature of the metallic melt during the transferring.

70. (Original) The method of claim 66, wherein the selected vessel temperature is approximately equal to the temperature of the metallic melt.

71. (Original) The method of claim 66, further comprising:

holding the metallic melt in an intermediate vessel prior to the transferring; and

controllably adjusting the temperature of the metallic melt in the intermediate vessel to the selected transfer temperature.

72. (Original) The method of claim 66, wherein the controlled rate of cooling of the metallic melt is no greater than about 1.0 degree Celsius per second.

73. (Original) The method of claim 72, wherein rounded solid particles have a diameter no greater than about 50 μm.

74. (Original) The method of claim 72, wherein the controlled rate of cooling of the metallic melt is less than 0.5 degrees Celsius per second.

75. (Cancelled)

76. (Original) The method of claim 1, wherein the vessel includes a plurality of heat transfer zones; and

wherein the cooling of the metallic melt at the controlled rate comprises independently controlling the temperature of the metallic melt disposed adjacent each of the heat transfer zones.

77. (Original) The method of claim 50, wherein the controlled rate of cooling of the metallic melt less than 0.5 degrees Celsius per second.

78. (Original) The method of claim 77, wherein the controlled rate of cooling of the metallic melt is within a range of about 0.01 degrees Celsius per second to about 0.5 degrees

Celsius per second.

79. (Original) The method of claim 50, wherein the rounded solid particles have a diameter in a range between about 40 μm and about 50 μm.

80. (Original) The method of claim 50, wherein the regulating includes transferring the metallic melt into the vessel at a selected vessel temperature that is approximately equal to the temperature of the metallic melt.

81. (Original) The method of claim 50, wherein the regulating includes:

transferring the metallic melt into the vessel at a selected transfer temperature and at a selected transfer rate; and

controlling a differential between the temperature of the metallic melt during the heating and the temperature of the metallic melt during the transferring.

82. (Original) The method of claim 81, wherein the selected transfer temperature is between the coherency temperature of the metal alloy and about 25 degrees Celsius above the liquidus temperature of the metal alloy; and

wherein the selected transfer rate is between about 0.01 pounds per second and about 1.0 pounds per second.

83. (Original) The method of claim 50, further comprising:

holding the metallic melt in an intermediate vessel prior to the transferring; and

controllably adjusting the temperature of the metallic melt in the intermediate vessel prior to the transferring.

84. (Original) The method of claim 50, wherein the vessel includes a plurality of heat transfer zones; and

wherein the cooling of the metallic melt at the controlled rate comprises independently controlling the temperature of the metallic melt disposed adjacent each of the heat transfer zones.